

MY·PICTURE·BOOK OF RAILWAYS

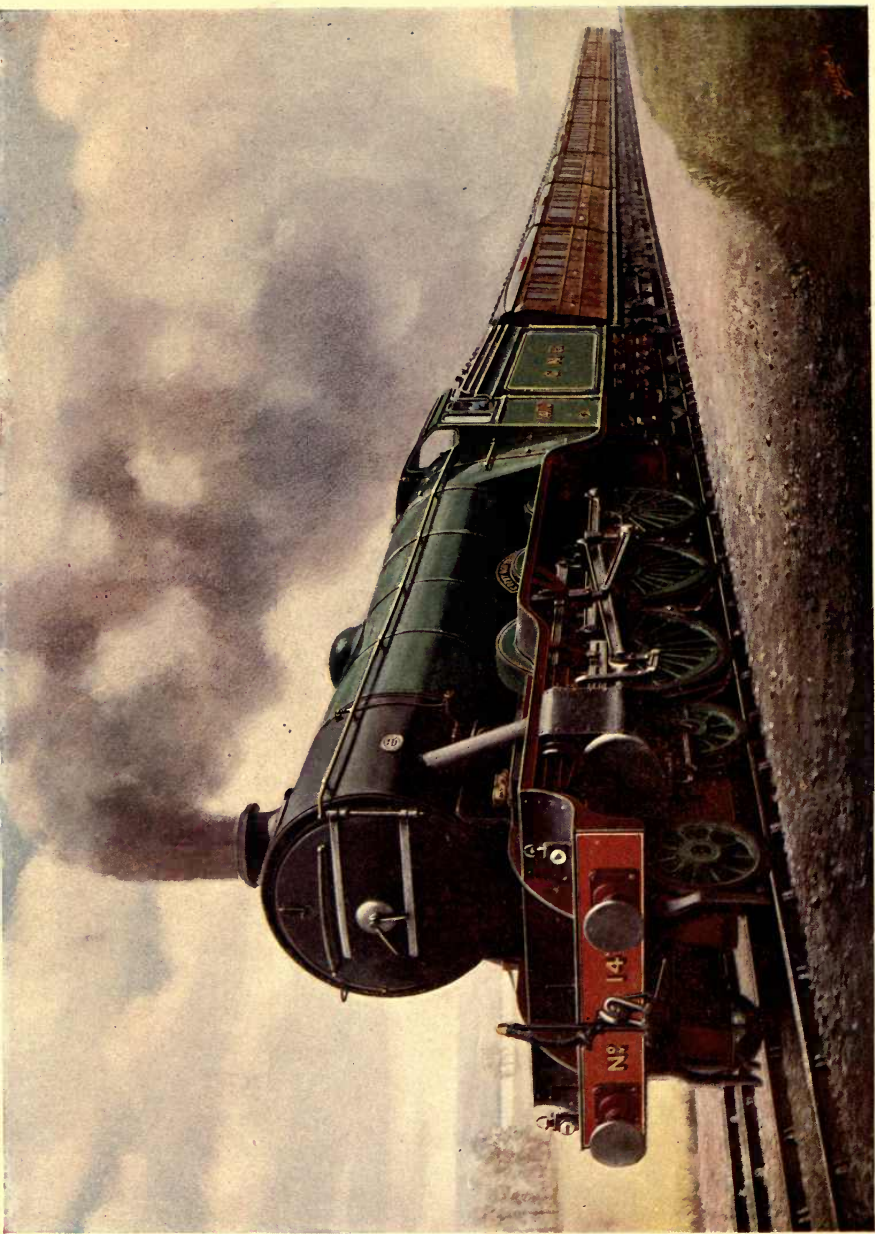
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THE
DANDELION-PUFF
BALLOON CLUB
PRIVATE





ONE OF THE LATEST AND LARGEST BRITISH ENGINES.

A 4-6-2 Three Cylinder Express Locomotive, weighing nearly 150 tons, London & North-Eastern Railway (Great Northern Section).

MY PICTURE BOOK
OF
RAILWAYS

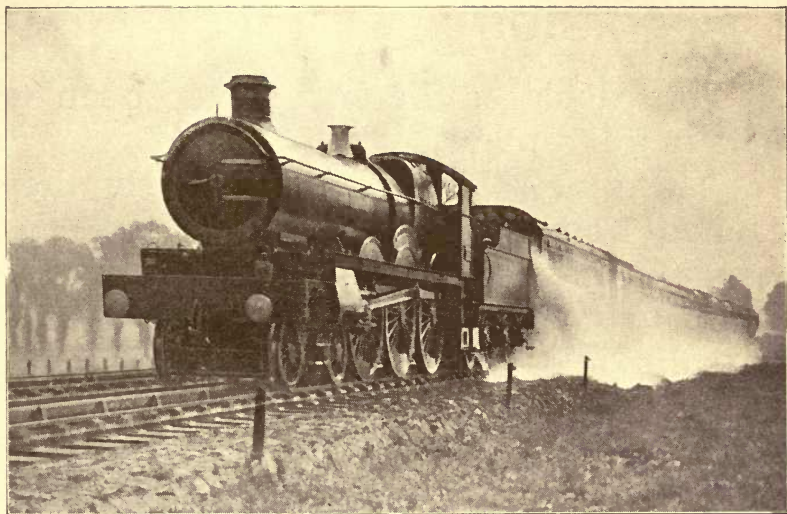


*WITH TWO COLOURED PLATES AND SEVENTY
ILLUSTRATIONS*

WARD, LOCK & CO., LIMITED
LONDON AND MELBOURNE



THE DRIVER.



[F. E. Mackay.]

A GREAT WESTERN EXPRESS PICKING UP WATER.

ABOUT ENGINES

“A MAN sat watching a kettle boil —” Father began.

“I know,” Betty broke in.

“James Watt,” said Tom. “And he invented the steam engine.”

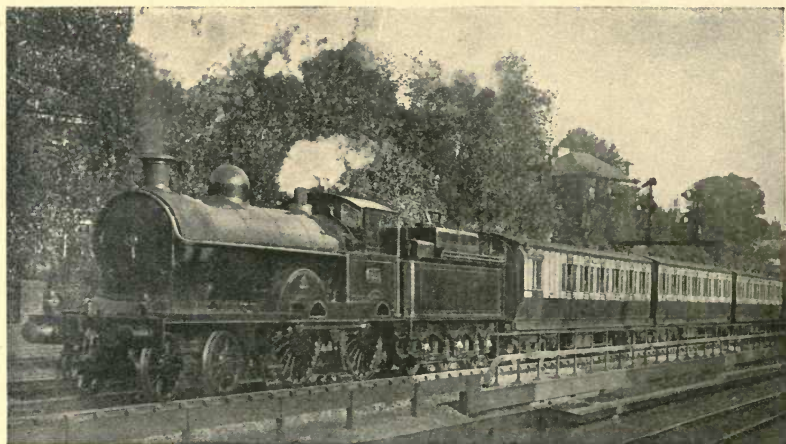
“But do you know who first made a locomotive?”

As the children did not, and as Mother wanted them out of the way while she made jam, their Father said that the next afternoon he would take them to see the locomotives in the big Museum at South Kensington.

ABOUT ENGINES

Tom declared he had never been to such a jolly place.

“Mother !” he cried directly they reached home, “I’ve driven the *Rocket* and the what’s-its-name—the first engine to run on smooth rails, you know—only the rails had pegs at the side and the

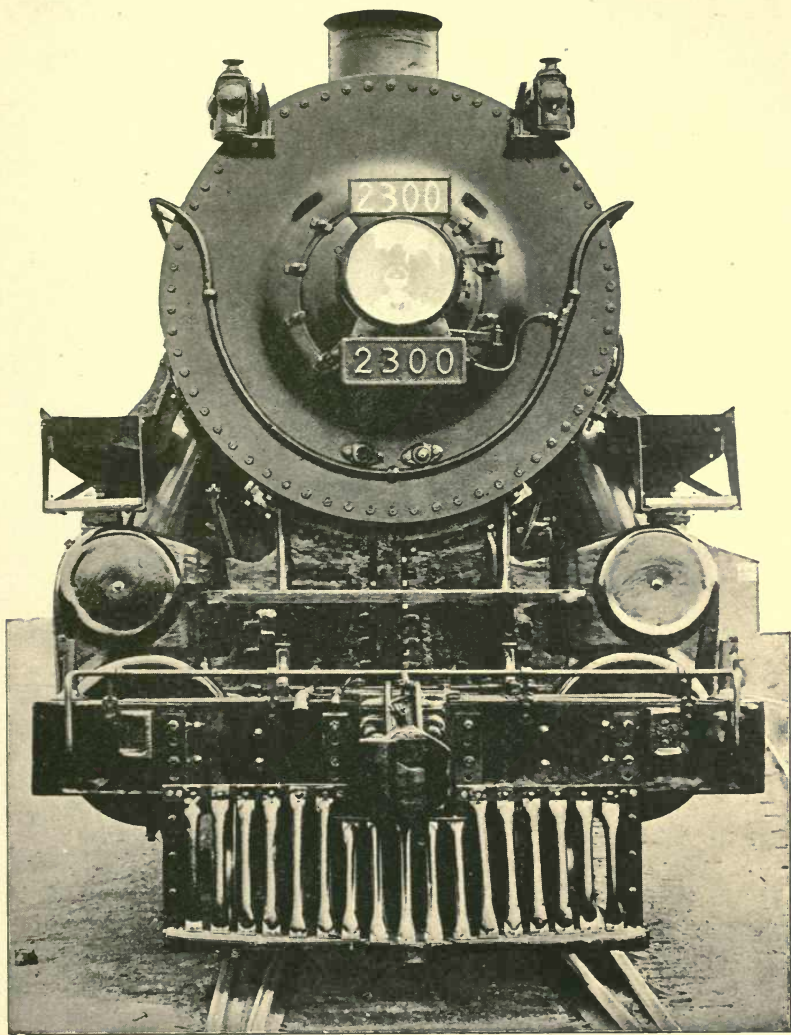


OIL-BURNING LOCOMOTIVE "WATT," LONDON, MIDLAND & SCOTTISH RAILWAY (L. & N.W. SECTION). [F. E. Mackay,

engine worked its way along by cog wheels which fitted over the pegs. And we saw the *Puffing Billy* ; that was the—the—”

“The first engine to run on smooth rails without cogs,” said Dad.

“Oh yes ; it was so heavy, you see,



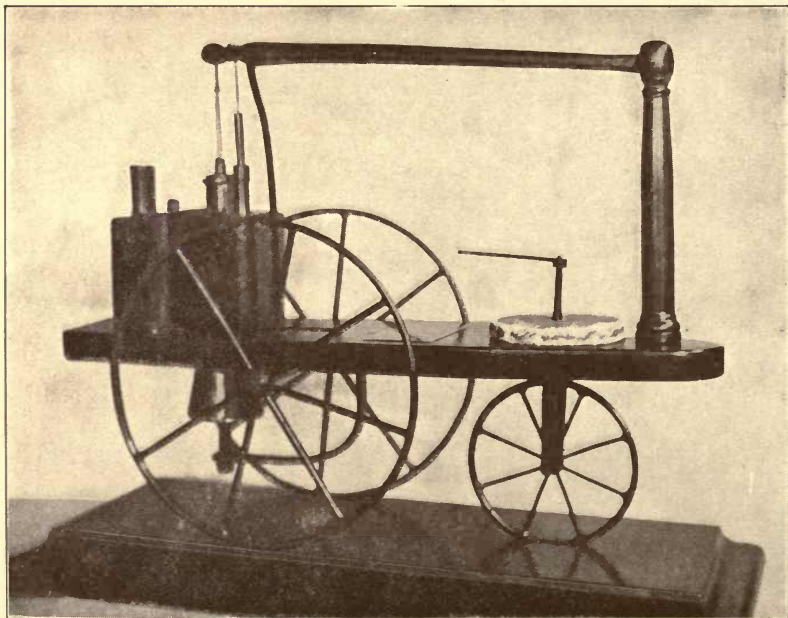
A MONARCH OF THE RAIL.
THE FRONT OF A CANADIAN PACIFIC RAILWAY LOCOMOTIVE.

ABOUT ENGINES

Mum, that the wheels simply couldn't slip. And it had such a high chimney and—what else was it, Dad ? ”

“ Grasshopper cranks,” said Betty, who loathed insects.

“ That's it,” agreed Tom. “ The pistons weren't low down by the wheels like those on *our* engines, but were high up, and the rods and pipes *did* look like grasshoppers' legs.”

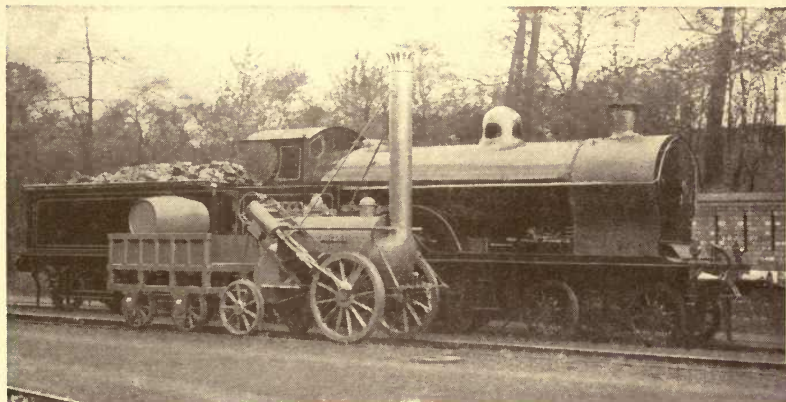


[Illustrations Bureau.

WHAT IS IT ?

THE FIRST LOCOMOTIVE MADE IN ENGLAND. INVENTED AND CONSTRUCTED AT REDRUTH, CORNWALL, BY WILLIAM MURDOCK IN 1784.

ABOUT ENGINES



AN INTERESTING COMPARISON.
THE "ROCKET" AGAINST A MODERN ENGINE OF THE LONDON, MIDLAND & SCOTTISH RAILWAY
(LONDON & NORTH WESTERN SECTION).

"The *Rocket* was fine," Tom went on. "There was the real *Rocket*, awfully high and awfully old, and there was a lovely little model, all spick and span, that worked when we turned the handle.

"But you should have seen the other models, Mum. Crowds of them, all working. And one was cut in half so that you could see its inside. Do you know what makes an engine go, Mum? Shall I tell you?"

"Please do," said Mother.

"There's a fire, of course, but that's at one end of the engine and the chim—I mean smoke stack—is at the other.

ABOUT ENGINES

In between is the boiler, full of water, and through the boiler run dozens of little copper tubes, which act as chimneys to the fire. You see, if they had only *one* flue it would heat the water only in one place, so they put in as many as they can, and the water gets hot all over."



[Print supplied by Great Western Railway.]

IN THE DAYS OF THE IRON HORSE.

A LOCOMOTIVE DRAWING PRIVATE COACHES AT ABINGDON ROAD STATION (1844).

"What happens then?" asked Mother.

"When the water gets *very* hot, steam comes, and this is taken through pipes to the sill—"

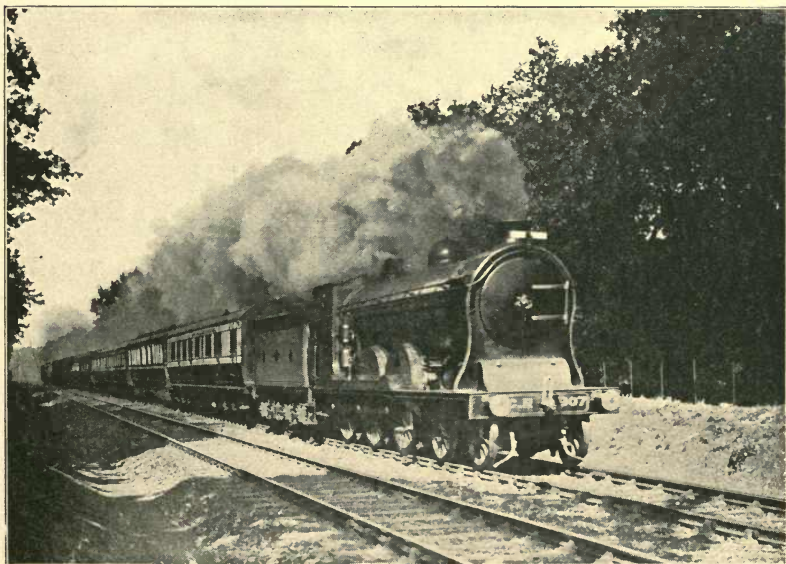
"Cylinder," prompted Dad.

"Yes, that's it: cylinder," Tom continued. "A cylinder, Mum, is something



[F. E. Mackay.

SCOTCH EXPRESS, LONDON, MIDLAND & SCOTTISH RAILWAY (L. & N.W. SECTION).



[F. E. Mackay.

GLASGOW-LONDON EXPRESS, L.M. & S.R. (CALEDONIAN SECTION).

ABOUT ENGINES

like a bicycle pump. If you blow through the hole at the end, the handle slides out, and that's what the steam does to the piston in an engine."

"What about the vowel?" asked Betty.

"The *valve*," corrected Dad.

"Such a dear little brass thing, Mummy, that keeps bobbing to and fro and lets the steam——"

Dad took up the tale. "It lets the steam in first at one end of the cylinder and then at the other, and so pushes the piston backwards and forwards."

"Talking of steam——" said Mother.

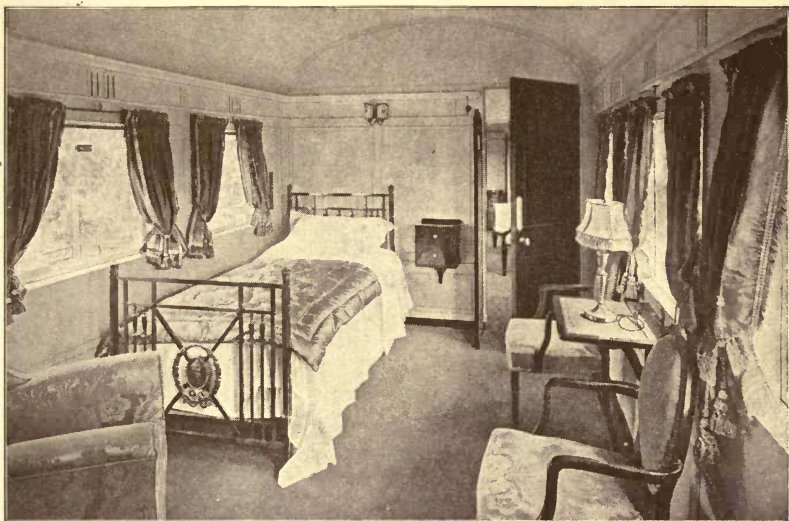
"Bath night!" Father cried.

"Who's first? Off you go!"

And the rest of what they saw at South Kensington had to wait till another time.



"HOW IT WORKS."



THE KING'S SALOON, L. & N.E.R. (GREAT NORTHERN SECTION).
WHEN USED FOR DAY JOURNEYS THE BED IS TAKEN OUT AND THE COMPARTMENT IS MADE
INTO A DINING-ROOM.

ABOUT TRAINS

“WHO’S for a walk ?” asked Father.
The train was taking them to the seaside at about sixty miles an hour, but Dad was always inventing such lovely new games that Tom and Betty at once asked, “Where to ?”

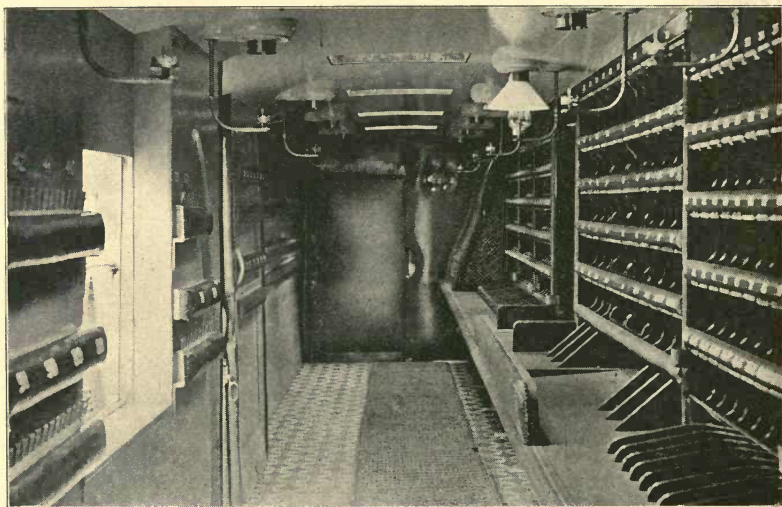
“Well, say to the Post Office, or perhaps to the Tea Shop. We shall see ; but will you come ?”

Of course they would !

All down one side of their carriage ran a narrow passage, and they found that by crossing the little bridge at the

ABOUT TRAINS

end (which shut up like a camera when not wanted) they could pass into the next carriage. All kinds of people they saw, and then they suddenly came upon a real kitchen, with white-capped cooks and rows of shining pots and pans ! There



INSIDE A TRAVELLING POST OFFICE.

was a delicious odour of cooking, and as the kettles were boiling, Dad said they must hurry along if they were to visit the Post Office before teatime.

Beyond the kitchen was the Tea Shop, with tables all nicely laid for tea. Then they came to a locked door with only

ABOUT TRAINS

a small window in it. "This is the Post Office," said Dad, and Betty, peeping through the window, saw a long carriage with rows and rows of pigeon-holes down either side and in the middle, and into these holes men were casting letters and postcards and newspapers as quickly as anything.

Dad said that by sorting the letters on the train it was often possible to deliver them in a town hundreds of miles away from that in which they had been posted only a few hours before, though if the sorting were done at an ordinary Post Office the letters would not reach their destination until the next day.

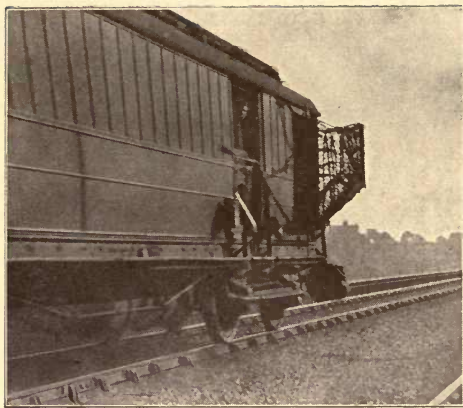
"They're opening the door," said Tom as he peeped.



[F. B. Mackay.]

"A BAG OF LETTERS FOR PLACES
THROUGH WHICH THE TRAIN
WOULD PASS."

ABOUT TRAINS



[F. E. Mackay.

"THE NET WAS TO COLLECT THE BAG OF LETTERS."

Dad very quickly guessed what was going to happen. "If we look out of this window," he said, "we shall see them deliver the first lot of letters, and perhaps pick up

some more for delivery farther on."

When they had grown used to the wind and the smuts they noticed that the post office carriage had hanging from it what looked like the end of a football goal net, upside down. Below the net they saw hanging a bag that Dad said contained the letters for the town they were approaching, while the net was to collect a similar bag of



[F. E. Mackay.

"THEN—SNIP! THE BAGS WERE SWEEPED FROM THEIR PEGS."

ABOUT TRAINS

letters from that town to places through which the train would pass.

Soon they saw a small hut rushing towards them—it didn't really rush towards them, of course, though it seemed to—and near the hut were a net similar to that on the train and a tall pole from which hung a bag.

Then—snip! Bags and nets quickly met; the bags were swept from the pegs on which they had hung, and when the Post Office had taken in their net and the bag it contained, Dad announced that if Tom was really to have tea with Mother and Betty he would need to wash.



A BEDROOM ON A TRAIN (NIGERIAN RAILWAYS).

NOTE THE MOSQUITO NETS.

ABOUT TRAINS

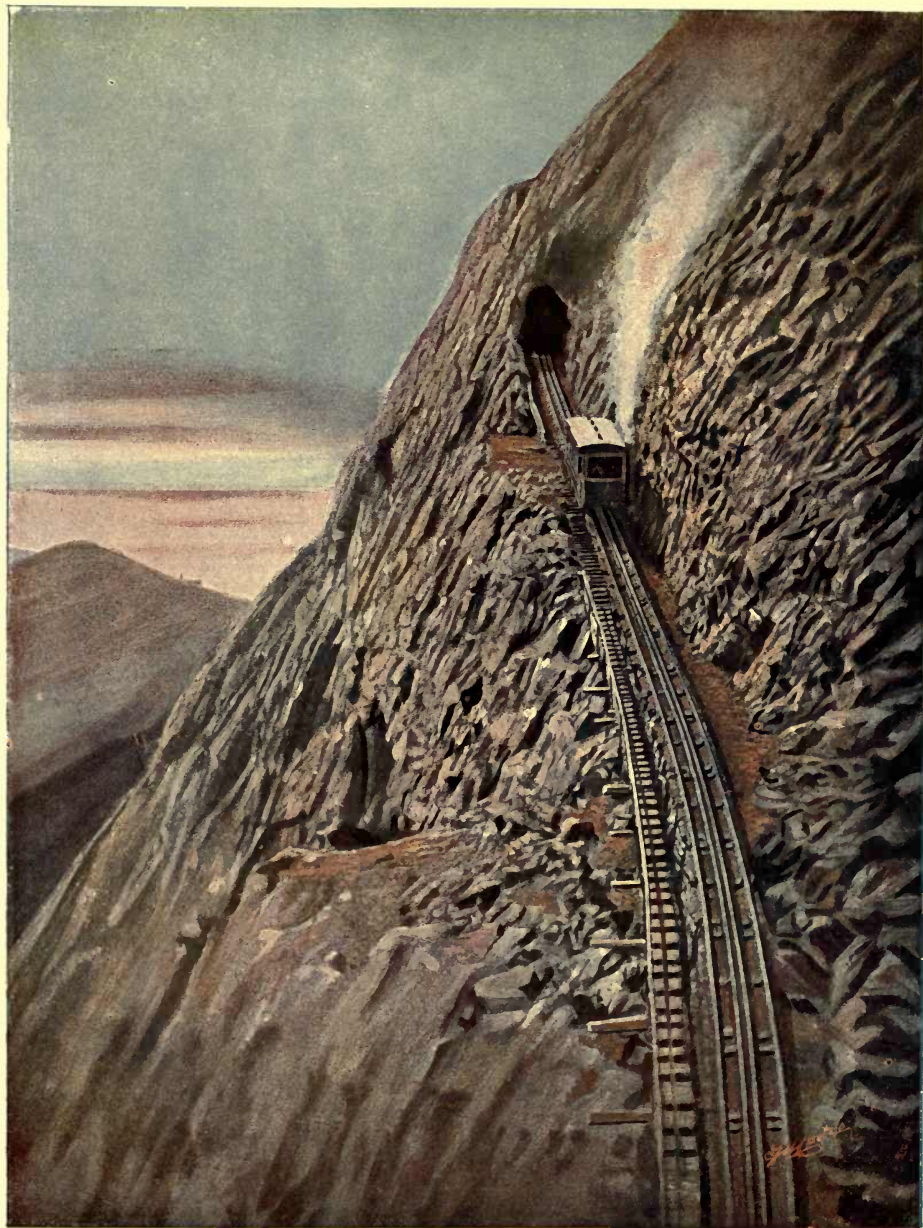
“Here’s the bathroom”—and there it was, sure enough, with hot water, clean towels and a nice cake of soap. Tom and Betty thought it wonderful on a train going sixty miles an hour, but Dad told them that in India and other hot countries trains have even baths attached.

Tea was lovely. Afterwards they walked along until they came to the guard in his van. He was intently looking out of the window at something behind the train. When Tom and Betty looked they saw that the end carriage had been unhooked from the train and was fast dropping behind. The last they saw of it was as it came to a stop in a wayside station.

Almost immediately the train began to gather speed again.

Father explained that the end carriage was a “slip coach.”

“Some trains,” he said, “start out with more than a dozen coaches, but arrive at their journey’s end with only two or three, the remainder having been



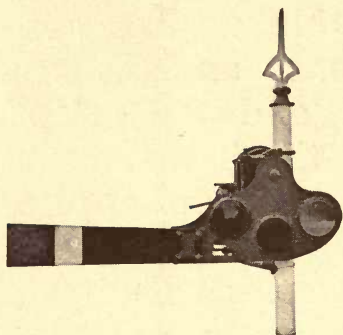
A MOUNTAIN RAILWAY, SWITZERLAND.

ABOUT TRAINS

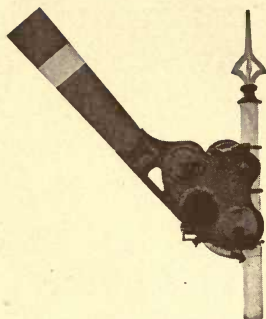
left behind on the way. When the guard in a slip coach pulls a lever, the connections between his coach and the rest of the train fall apart and the 'slip' runs along on its own till it arrives at the desired point, when the guard applies the brakes. In this way people can travel by a train to stations at which the train never stops, and even to places near which it never runs.'"



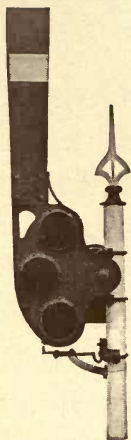
"BEYOND THE KITCHEN WAS THE TEA SHOP, WITH TABLES ALL NICELY LAID."



Stop (Red Light).



Go Carefully (Yellow Light).



Go Ahead (Green Light).

SOME STRANGE SIGNALS.

SIGNALS

“JUST look at that signal,” cried Betty one day as they walked through the fields near a railway.

And really it was rather curious. To begin with, it was painted bright yellow ; to continue, it pointed *upward*, and then, as if that were not enough, a train ran merrily past it without even whistling “How do you do ?”

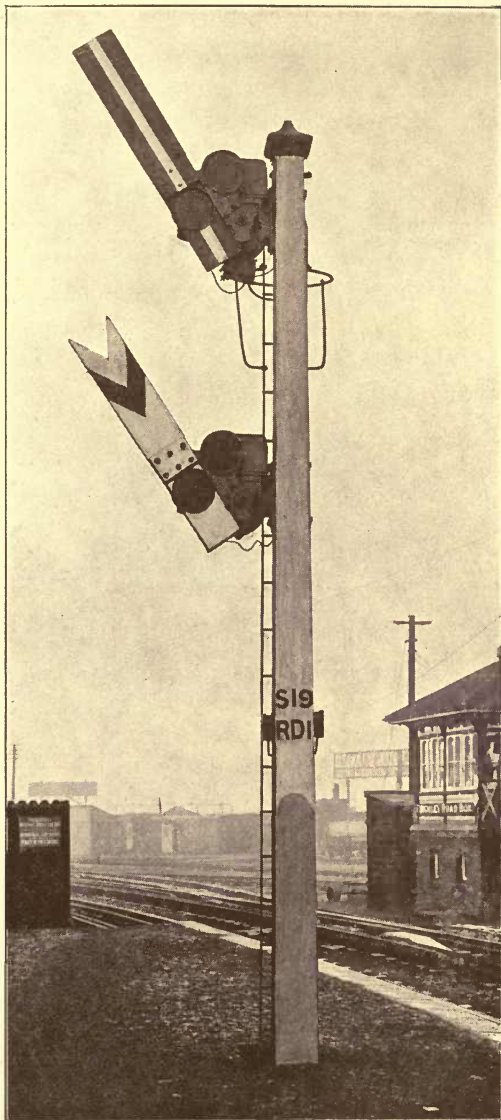
As soon as the train had passed, the signal arm dropped till it stuck straight out and looked like any other signal.

Dad knew a lot about railways, so Tom and Betty soon learned that this

SIGNALS

was one of the latest kinds of signal. If anything were to go wrong with the works, the signal arm would fall down, but as "down" in this case meant "stop," there would be much less chance of an accident.

By the time their walk was over the children had discovered several funny signals. Some, they found, had straight



ANOTHER STRANGE-LOOKING SIGNAL ON THE METROPOLITAN RAILWAY.

SIGNALS

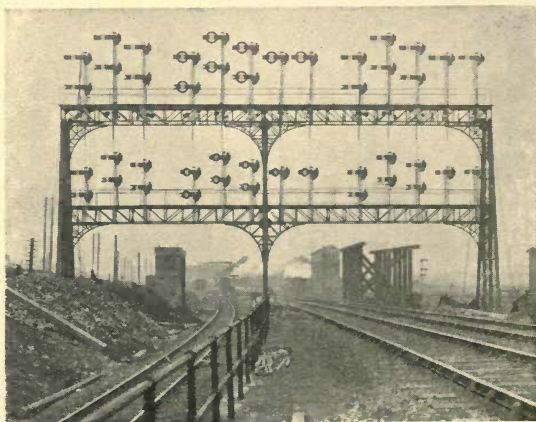


"STOP" SIGNAL.
"DISTANT" ARM BELOW.

ends, others had a notch cut out, and others had large white rings on them. They even saw one with a wooden X on it, but Dad said that was just being built, and the X was like the X on certain children's sums.

And they knew what *that* meant!

The most important signals were those with square ends ; they were called "stop" signals, and when they said stop they meant stop. The notched signals were warnings to drivers that

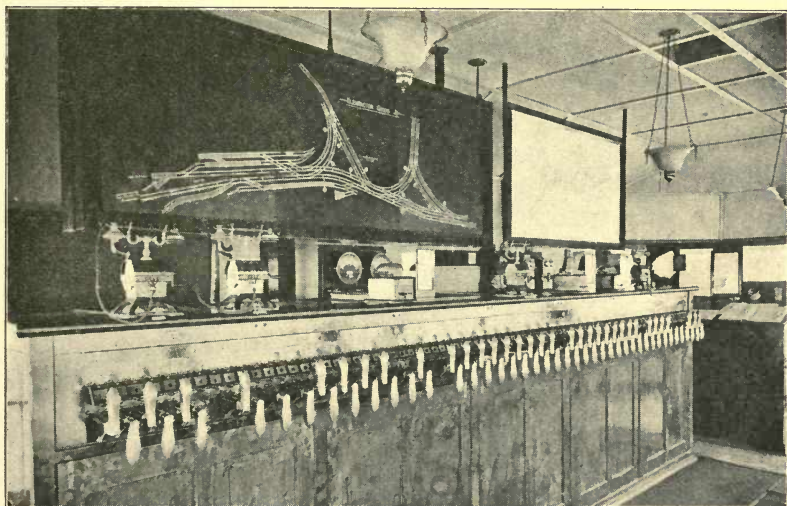


AN IMPORTANT GROUP OF SIGNALS AT
RUGBY.

SIGNALS

they were approaching a stop signal. If the notched, or "distant," signal were up, it meant really "get ready to stop if necessary"; when down, its message was "all clear; the stop signal is down."

Outside great stations like Rugby



ELECTRIC SIGNALLING.

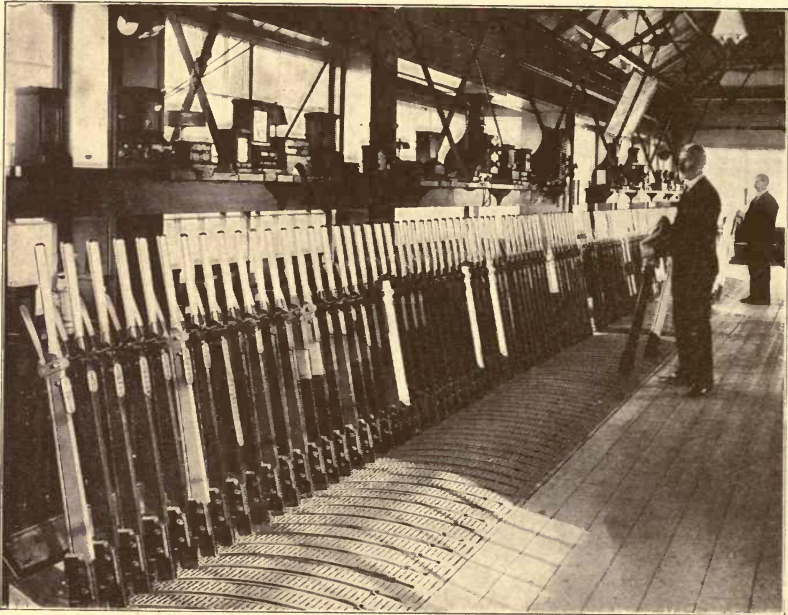
ABOVE THE SWITCHES IS A MAP ON WHICH THE MOVEMENTS OF TRAINS ARE SHOWN BY MEANS OF LIGHTS.

there are often so many signals that it is necessary to mark them in some way that will tell which line they refer to. In some places signals have large numbers painted on them, but where the train would travel too fast for the driver to

SIGNALS

read the numbers, the fast and main-line signals are distinguished from the slow and local lines by the white circles attached to local signals.

Sometimes signal-boxes are very large



A MANUAL SIGNAL-BOX.

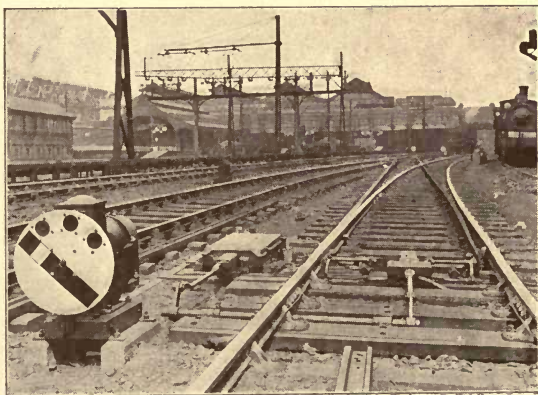
COMPARE THIS PICTURE WITH THAT OF AN ELECTRIC SIGNAL-BOX.

indeed, and the clatter of heavy levers goes on day and night with hardly a pause ; but nowadays electricity is coming to the signalman's aid, and instead of pulling great levers he just moves a

SIGNALS

small electric switch and the signals move accordingly. One of the results of this new arrangement is that, as the apparatus takes up so much less room, signal-boxes can be made much smaller than formerly, and an astonishing number of lines can be controlled from quite a small box.

The signalman has a very responsible task and often a very busy one. Gradually, however, there have come into use a number of clever devices which make it almost impossible for him to go wrong. He cannot, for instance, signal to a train to enter a section of line until the preceding train has passed the other end of that section. He cannot set the points one way and the signals another. Where he cannot see a signal from his cabin, he often has a



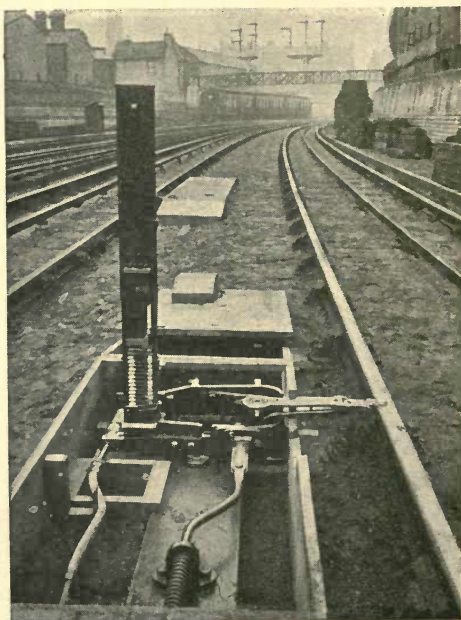
ANOTHER KIND OF SIGNAL.

SHUNT SIGNAL ("GO CAREFULLY" POSITION), SOUTHERN RAILWAY (SOUTH-EASTERN & CHATHAM SECTION).

SIGNALS

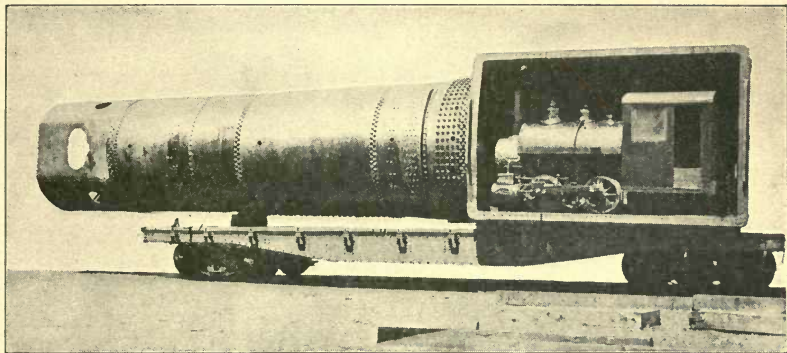
little model of it over the lever, and if, when the lever is pulled, the model does not move, he knows the real signal has gone wrong, and he is generally able to notify the oncoming train before disaster occurs.

Other machines cut off the steam of a train which has passed a point where it should stop, but the thing that Tom looked at longest when Father took them to see a big signal-box was a picture of the lines controlled from that box : as the trains moved along the lines, so little lights on the picture showed exactly where they were. On another page is a picture of such an " illuminated diagram " in use in an Australian signal-box.



MODERN FOG-SIGNALLING.

THIS CLEVER DEVICE IS OPERATED WITH THE SIGNAL AND A MAN IS NOT NEEDED TO PLACE THE DETONATOR ON THE LINE. AS EACH DETONATOR IS EXPLODED THE APPARATUS SETS A FRESH ONE.



[Fleet Agency.]

AN ENGINE IN A FIREBOX.

THE ENGINE OF WHICH THE BOILER FORMS PART WILL HAUL 7,750 TONS AT 10 MILES AN HOUR AND HAS 16 DRIVING WHEELS.

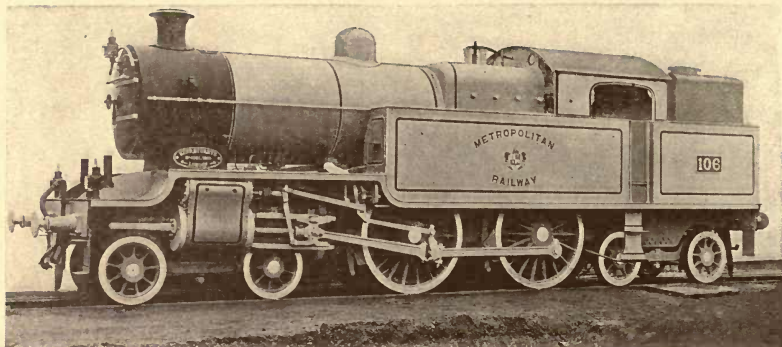
MORE ABOUT ENGINES

“WE saw a bogey train and a fairy train at South Kensington, Mummy,” said Betty.

“A *what* ?” gasped Mother in astonishment.

But Betty had forgotten what they really were, so Father (who knows so much about railways that Tom can never understand why he isn’t an engine-driver) explained that railway “bogies” were really big castors, like those on table legs, but instead of having, like a castor, one wheel, each bogie had four wheels. Though quite strong, they could swing round and easily follow the curves of

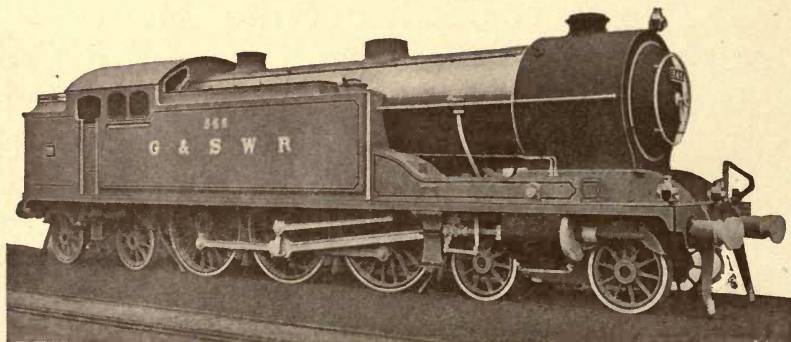
MORE ABOUT ENGINES



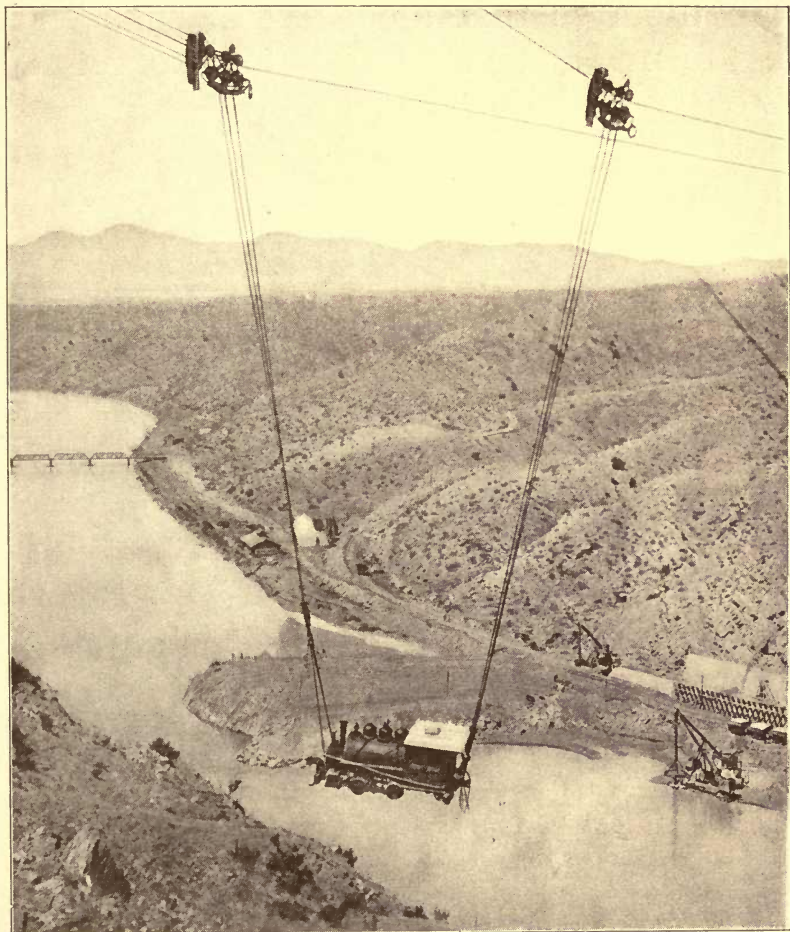
SUPERHEATER TANK ENGINE, METROPOLITAN RAILWAY.

rails. By means of bogies, carriages and engines could be made much longer than would be possible if the wheel-axles were fixed.

“What Betty called the fairy train,” he continued, “was really a very peculiar engine, though the name of its inventor was Fairlie, not fairy. If you were to



A POWERFUL TANK ENGINE, L.M. & S.R. (GLASGOW & SOUTH WESTERN SECTION).

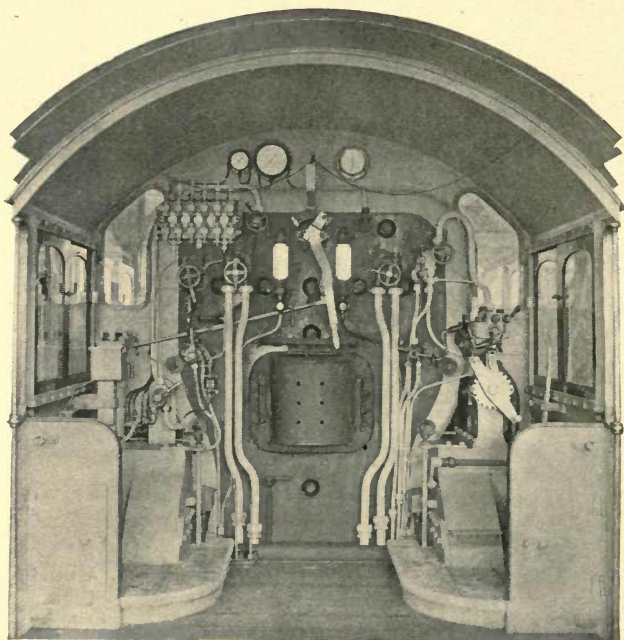


ONE WAY OF GETTING ACROSS.

**THIS ENGINE WAS RUN ACROSS A MEXICAN CANYON ON TWO CABLEWAYS EXTENDED
BETWEEN SUPPORTING TOWERS A QUARTER OF A MILE APART.**

MORE ABOUT ENGINES

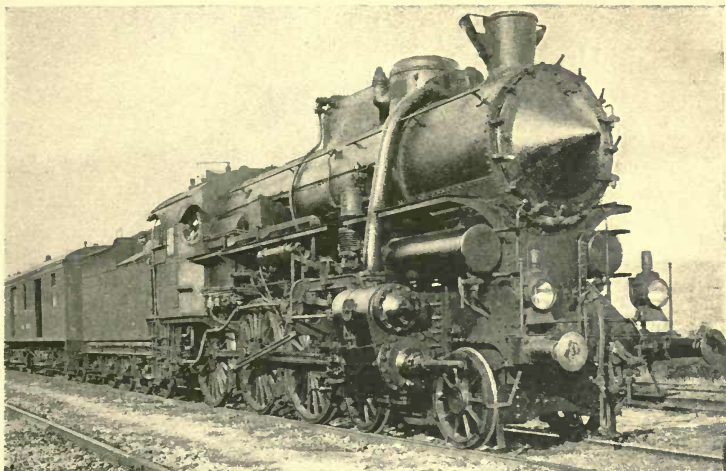
take two engines, without tenders, and join them so that the drivers' cabs were in the middle, you would get something like the Fairlie locomotive."



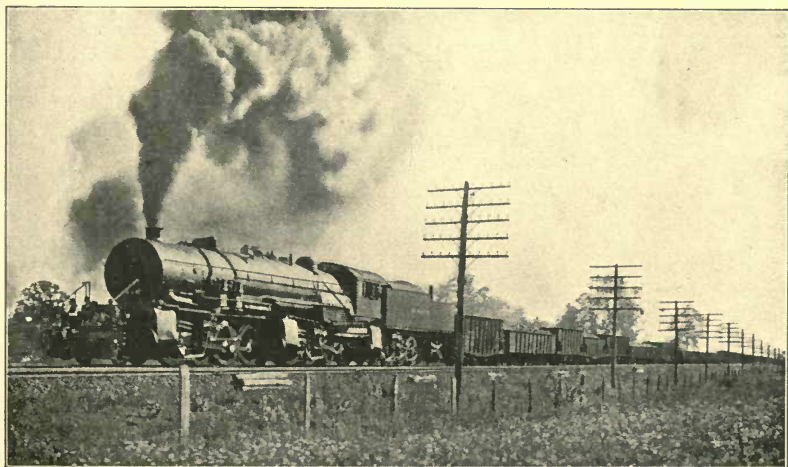
WHERE THE DRIVER STANDS.
FOOTPLATE OF A LOCOMOTIVE, LONDON & NORTH EASTERN RAILWAY.

Mother wanted to know why they made engines like that.

"Special jobs, my dear," said Father.
"All engines are made for their particular jobs, you know, and the Fairlie engine



A STRANGE-LOOKING LOCOMOTIVE, HUNGARIAN STATE RAILWAYS.



ONE OF THE WORLD'S BIGGEST LOCOMOTIVES.

THIS MONSTER, WHICH IS USED FOR HEAVY TRAINS ON THE ERIE RAILROAD, HAS TWENTY-EIGHT WHEELS IN ALL.

MORE ABOUT ENGINES

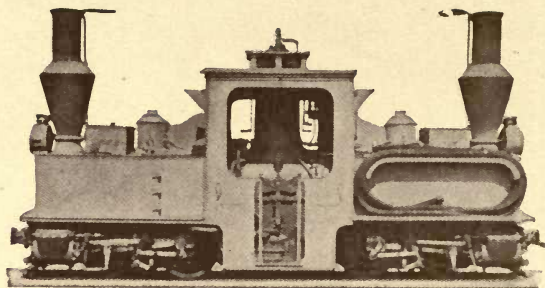
is very useful on railways which have a lot of sharp curves.

In America it is quite common for a locomotive to

be jointed, or articulated, so that it can get round curves more easily.

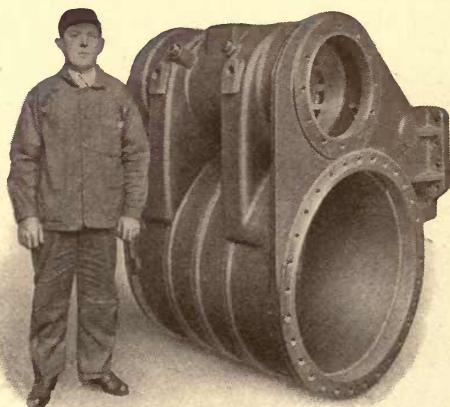
“ You will find that engines which pull heavy loads generally have a number of wheels tied or coupled together so that

the piston's effect is spread over several wheels and the engine is able to get a better grip on the rails. Engines that pull suburban passenger



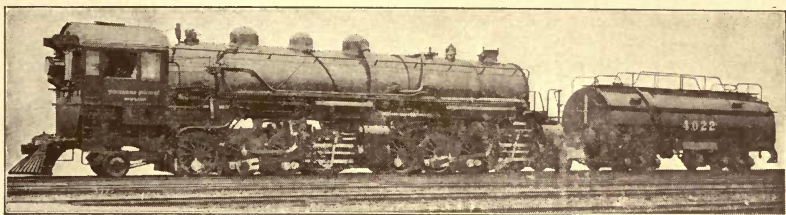
A RAILWAY FREAK.

THESE "PECHOT" LOCOMOTIVES ARE SIMILAR TO THE "FAIRLIE" ENGINES. THEY ARE USED ON NARROW-GAUGE LINES HAVING SHARP AND FREQUENT CURVES.

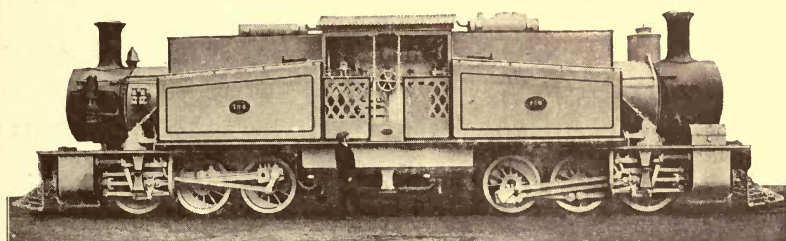


WHERE THE PISTONS WORK.

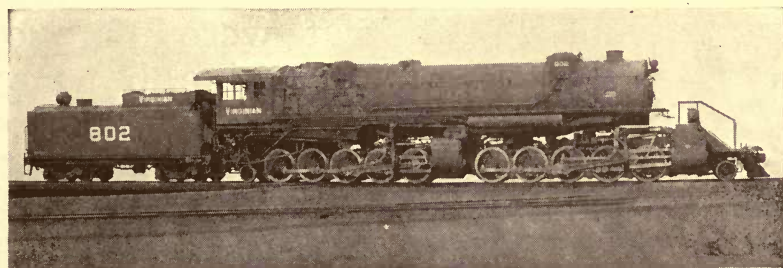
ONE OF THE CYLINDERS OF A MAMMOTH LOCOMOTIVE.



**A REVERSED OIL-BURNING ENGINE ON THE SOUTHERN PACIFIC RAILWAY.
THE DRIVER'S CAB IS PLACED IN FRONT, AND THE OIL TENDER IS TOWED AT THE FUNNEL
END OF THE LOCOMOTIVE.**



**A "FAIRLIE" ENGINE.
USEFUL ON SHARP CURVES.**



**A VIRGINIAN RAILWAY GIANT.
TWENTY OF THE THIRTY-TWO WHEELS OF THIS GREAT LOCOMOTIVE ARE COUPLED TO ENABLE
IT TO HAUL HEAVY LOADS OVER THE MOUNTAINS.**

SOME CURIOUS AMERICAN LOCOMOTIVES

MORE ABOUT ENGINES

ger trains also have a number of wheels coupled so that they can get a good grip on the rails and quickly pick up speed. Engines which do not have to start and stop frequently, but to run long distances quickly, do not as a rule have more than two pairs of wheels coupled, and their wheels are generally rather larger than others. The wheels of goods and local passenger engines are generally a trifle smaller than the others."

"Like a three-speed bike on low gear?" asked Tom.

"Yes, the idea is the same. When I was young, main-line engines had very big driving wheels that were more or less like the *top* gear on a bike, but they were found to be so hard to start and so liable to slip that they were discarded. Besides, you must remember that the size of engines is fixed by the size of our tunnels and the width of our rails—"

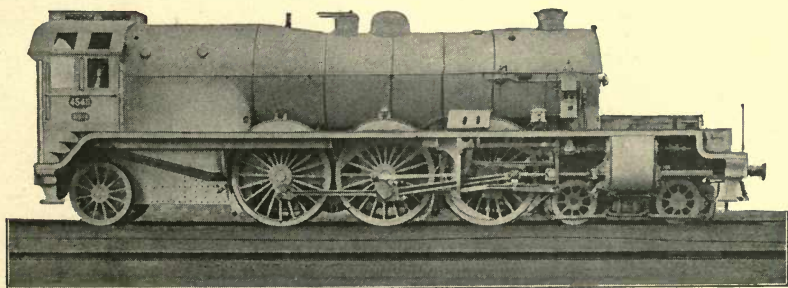
("Four feet eight and a half," whispered Tom to Mother.)

"—and big wheels mean narrow boilers; narrow boilers mean less steam

MORE ABOUT ENGINES

power, and less steam power means weaker engines. So flywheels have gone ; smaller wheels have come to stay, and more attention is being paid to the quality of the steam, which in the best engines is now 'superheated' : that is, after being formed in the usual way it is collected into small tubes which run through the flue tubes connecting the fire-box with the smoke stack. The steam is thus made hotter than ever, and is able to do its work more efficiently."

But the engines we know are able to do many marvellous things that Stephenson certainly never dreamt of. At the beginning of this book, for instance, is a photograph showing a Great Western engine picking up water while running at speed.



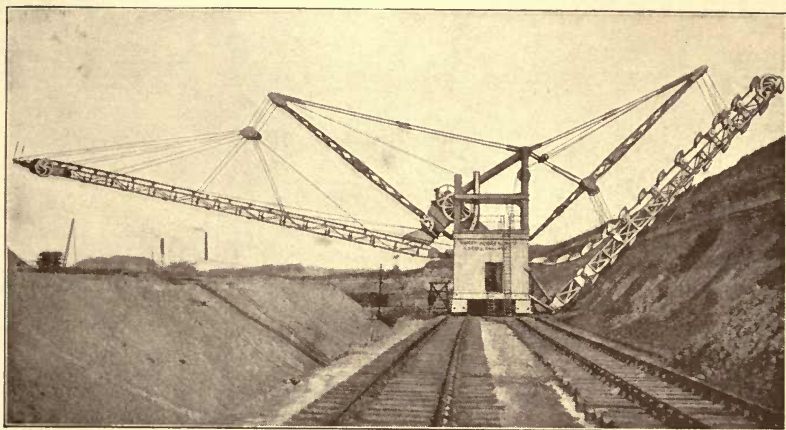
A STRANGE BELGIAN EXPRESS LOCOMOTIVE.



[E. N. A.]

MAKING A RAILWAY IN THE CONGO.

NATIVES LAYING DOWN ANT-PROOF METAL SLEEPERS. IF WOOD WERE USED THE ANTS WOULD QUICKLY DESTROY IT.



A MODERN RAILWAY-MAKER.

WHILE PART OF THIS MACHINE IS DIGGING, ANOTHER PART IS PLACING THE EXCAVATED SOIL IN TRUCKS TO BE CARRIED AWAY.

HOW RAILWAYS ARE BUILT

THE straightest railway in the world is in Australia, where 330 miles of line run in a perfectly direct line across the Nullarbor Plain. Only one other railway can approach that record, for not many countries are flat enough to allow more than a few miles of railway to be taken straight from point to point. As a rule there are hills, which have either to be avoided, cut through or tunnelled, or rivers or lakes which have to be avoided or bridged. The railway engineer is not often dismayed, for he has conquered tremendous difficulties and

HOW RAILWAYS ARE BUILT

has at his command many wonderful machines.

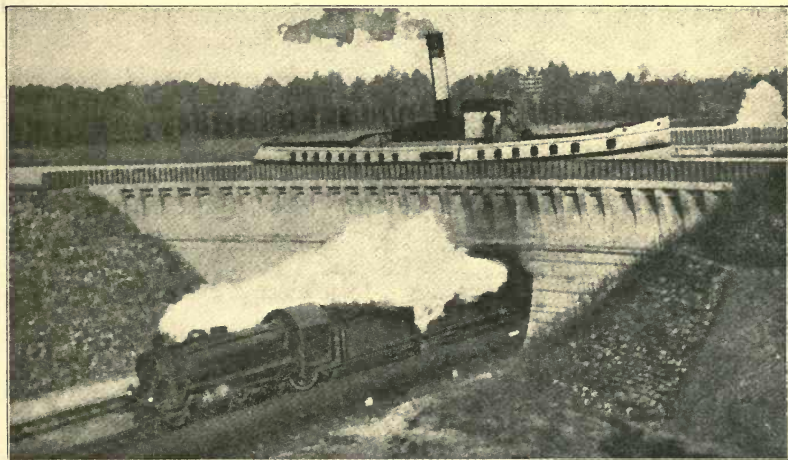
For instance, when laying a long stretch of line across a desert, he will get together a very long train, on the front of which are trucks loaded with sleepers, rails and everything needed for the new railway. He may even have these on a truck provided with machinery for carrying sleepers and rails forward to the exact spot where they are wanted.

Behind these store trucks will be several carriages which form the workmen's home while making the new railway. These have sleeping-bunks, dining-rooms, kitchens and—you may be sure—well-filled larders. When all is ready the train sets off, and if the line is to be laid over easy ground the engine will push slowly forward all day long, so that this wonderful train not only “makes tracks” but uses them.

Work is not always as quick, however, and very few railways can be laid until thousands of tons of earth have been removed and the way made less hilly. On

HOW RAILWAYS ARE BUILT

other parts of the route there will probably be valleys which have to be crossed by a bridge approached by embankments, and the earth from the cuttings comes in handy for making these embankments.



A SHIP CANAL CARRIED OVER A RAILWAY.

[E. N. A.]

Railway cuttings are mostly cleared by great machines known as steam navvies, which scoop up tons of earth at a time. Some of the best of these machines, like the one illustrated, also convey the earth to the top of the bank and dump it in trucks that wait to take it away.



WATERLOO STATION, LONDON, AT HOLIDAY TIME.

[Illustration.]

THE TALE OF THE STATION CLOCK

“**T**HERE can be no doubt who is the busiest worker here,” said the Station Clock.

“At an hour when all nursery clocks are ticking in their sleep I am wide awake hurrying up folk who have been out to theatres and parties and look like losing the last train home. When they have all gone I have to keep an eye on the porters whose work it is to load up the night luggage trains, and then, soon after two, I have to keep a sharp look-out for the men bringing newspapers straight from the

THE STATION CLOCK

printing press. They always leave it until the last possible moment, so that folk hundreds of miles away can have as much news as possible with their breakfast; but sometimes there is a terrible scramble to get all the papers on to the train in time.

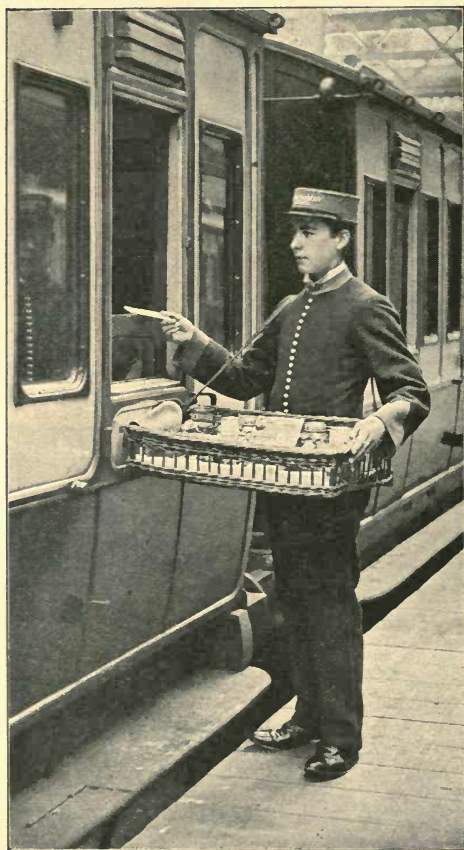
“ Almost before my big hand has had time to turn over twice, the early morning workmen’s trains begin to arrive, and I have to remind some of their passengers that there is no time for loitering ; a warn-



INSIDE A GREAT WESTERN BOOKING-OFFICE.

THE STATION CLOCK

ing I have to keep repeating as train after train brings in thousands of city workers.



"CHOCOLATES!"

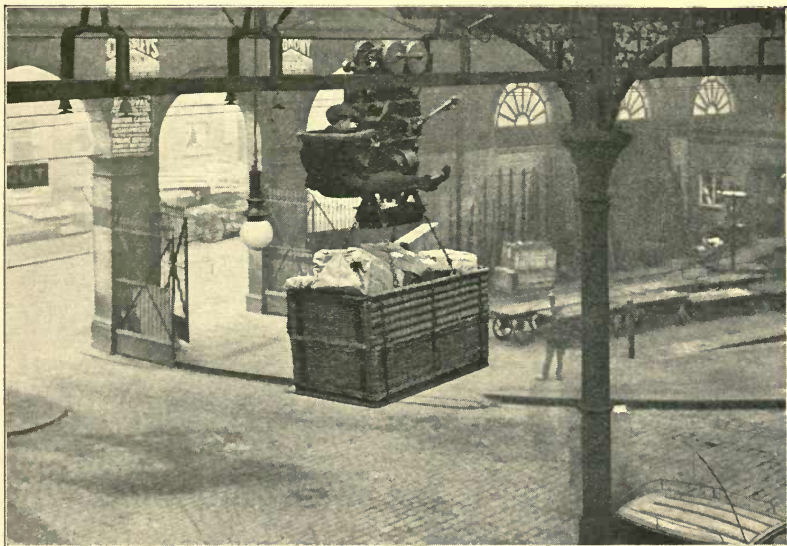
About eight, there arrive trains which have travelled all night, and as the passengers step yawning on to the platform I have to remind *them* that a new day began long ago and that the sooner they have breakfast the better.

"Soon after the last trainful of city workers has come in, the important day expresses are

brought to the platforms, and I have to keep urging the porters to hurry, or they will never get the great pile of luggage

THE STATION CLOCK

on board. Most of the passengers on these trains arrive in good time, but often one dashes up at the last moment and I have to be very careful lest the train goes without him.



A BUSY OVERHEAD RAILWAY.

AN OVERHEAD PARCEL-CARRIER, VICTORIA STATION, MANCHESTER. THE "TRAVELLER" IS WORKED BY AN ELECTRIC MOTOR.

“ But the busiest time of my week is Saturday afternoon. Then thousands of people come to the station at the same time and want to be taken at once to the country, the seaside, or just to their homes. There are generally plenty

THE STATION CLOCK

of trains, but they all try to catch the one that is almost too early for them, and I have the hardest job imaginable to prevent my great hand waving round and round and urging them to run faster and faster ! And yet all they say is ‘ Just look at that clock ! It’s *tearing* round ! ’

“ Ordinary afternoons are quieter, but after tea the city workers begin to arrive on their homeward way. Here, again, they nearly all want to catch the train that is really too early for them, and they all say it is *my* fault if they miss it ! On other platforms are drawn up trains with dining-cars from which lovely smells float up to where I hang. The cook looks out to see if it is time to put the potatoes on, and the passengers correct their watches by me so that they shall not be late for dinner. They are mostly business men going to towns some 200 miles away, so as to be ready for work first thing in the morning.

“ After the dining-car trains have left, the platforms are filled with trains that

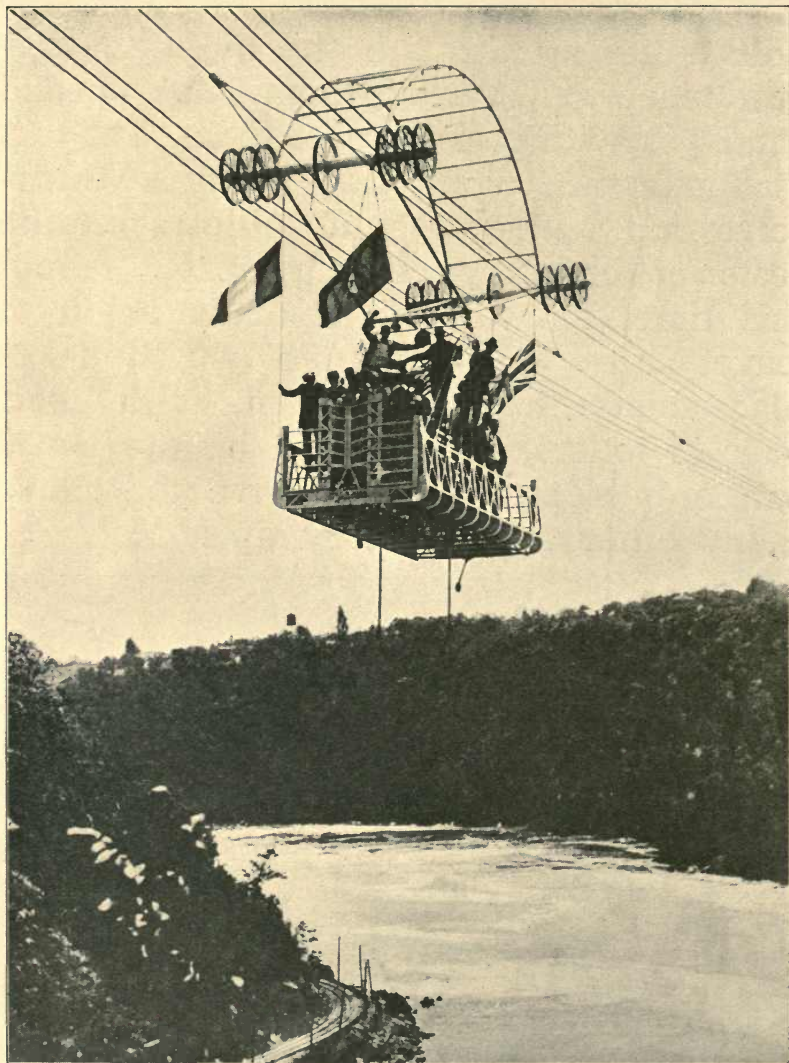
THE STATION CLOCK

will travel all through the night to distant places. Many of them have special carriages with real beds in them, but less fortunate passengers have to tuck themselves up with rugs and pillows on the seats of ordinary compartments. About this time, too, the night mails begin to leave, and a rare scramble usually takes place between the postmen, with their bags of letters, and my big hand. But I can only repeat what I have to tell so many other folk, 'Hurry up !' "



[E. N. A.]

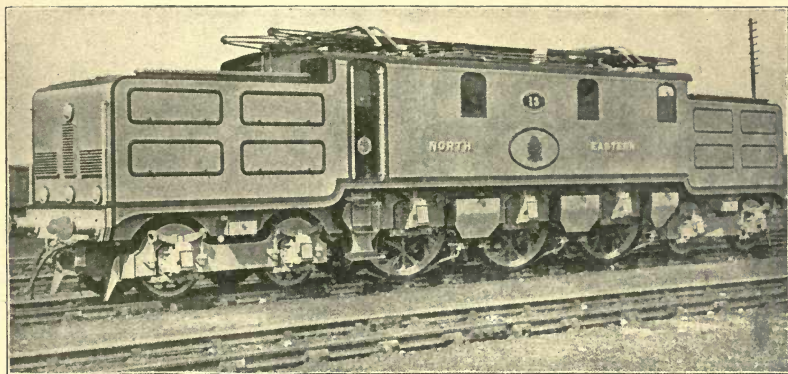
A REMARKABLE ELECTRIC SUSPENSION RAILWAY.
MOST TRAINS RUN ON RAILS: THIS ONE HANGS FROM THEM.



(Underwood & Underwood.)

THE NIAGARA FALLS ELECTRIC RAILWAY.

THIS CABLEWAY RUNS ABOVE THE FAMOUS NIAGARA WHIRLPOOL. THE CAR CAN HOLD THIRTY-SIX PERSONS.



AN ELECTRIC GIANT, L. & N.E.R. (NORTH EASTERN SECTION).
THIS POWERFUL TYPE OF LOCOMOTIVE CAN HAUL A TRAIN OF 450 TONS AT 65 MILES
AN HOUR.

ELECTRIC TRAINS

“ I’M going to be an engine-driver,”
said Tom.

“ Nasty dirty job,” retorted Betty.
“ And you know you don’t like being
washed.”

“ Shan’t have to be washed when I
grow up,” answered her brother.

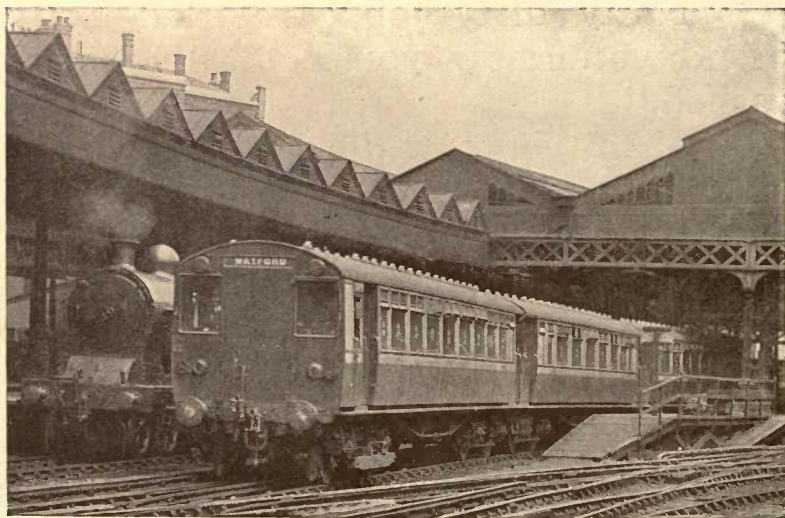
“ Why not try an electric engine ? ”
asked their Father. “ They are really
very exciting when you get a good one
like the big London and North Easterns.

“ Of course, with a steam engine you
start out with tons of coal and gallons
of water and make your own power as
you go, and that is very fine. But there

ELECTRIC TRAINS

are things just as jolly on an electric locomotive, and I dare say you *can* get dirty if you really want to."

In Switzerland and other countries where electricity is cheap, electric railways have been in use for many years, but it is only recently that they have been adopted to any extent on British lines, apart from the London "tubes." One of the most important users of electricity is the London and North Eastern Railway, who employ it for both goods and passenger working. Some of their locomotives are



THE OLD AND THE NEW.
STEAM TRAIN AND ELECTRIC TRAIN SIDE BY SIDE AT EUSTON.

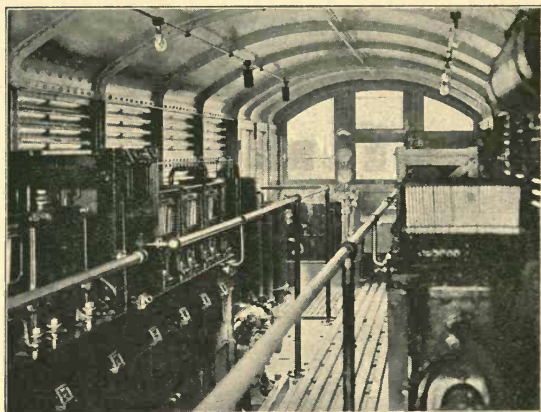
ELECTRIC TRAINS



ELECTRIC LOCOMOTIVE HAULING A MINERAL TRAIN, LONDON AND NORTH EASTERN RAILWAY (NORTH EASTERN SECTION).

tremendously powerful. Number 13, for instance, is capable of hauling loads of 450 tons at not less than 65 miles an hour. Another railway which has some fine electric locomotives is the Metropolitan, but most of the Metropolitan trains, like those of other electrified railways, include, instead of locomotive engines, carriages which have motors tucked underneath, between the wheels. All the motors on such a train can be controlled from one car, and by spreading the power along a train in this way it is possible to get very quick starting, a point of importance on busy lines.

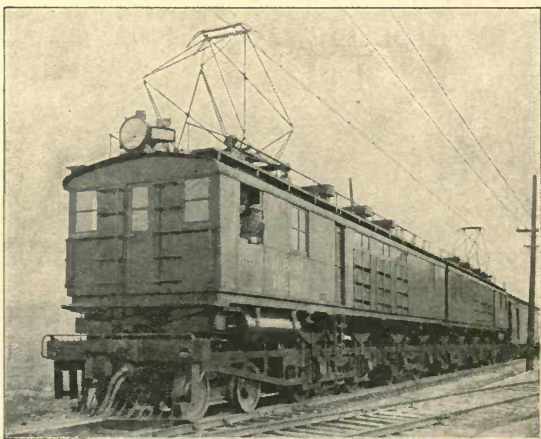
ELECTRIC TRAINS



VERY DIFFERENT FROM A STEAM ENGINE.
INSIDE A METROPOLITAN RAILWAY ELECTRIC LOCOMOTIVE.

There are various ways of supplying a running train with current. To begin with, electricity, to be useful, must flow, and before it

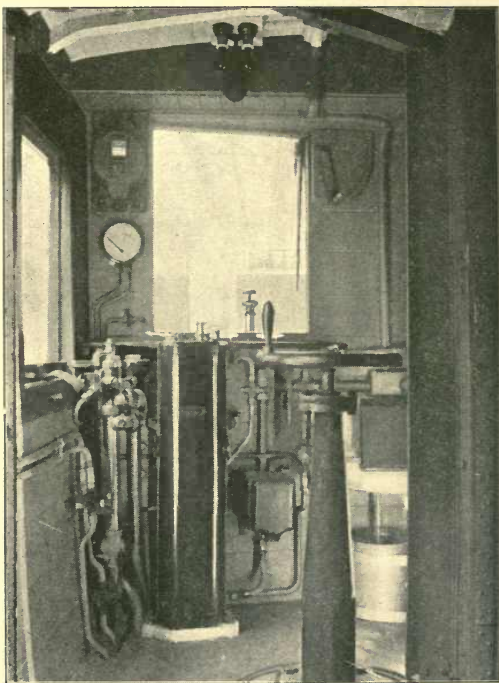
will flow a suitable path must be provided along which it can travel out and home again to the power station. On some railways the outward path takes the form of overhead wires, and the homeward one is a rail placed alongside the track. On



A MIGHTY ELECTRIC LOCOMOTIVE.
A 3,440 HORSE-POWER ENGINE WHICH HAULS TRAINS OVER THE
ROCKY MOUNTAINS.

ELECTRIC TRAINS

other railways the wire is replaced by a rail laid in the centre of the track. Yet another plan is to let the current find its way back along one of the running rails. From overhead wires the current is collected by



THE DRIVER'S WINDOW.
NOTE THE "DEAD MAN'S HANDLE."

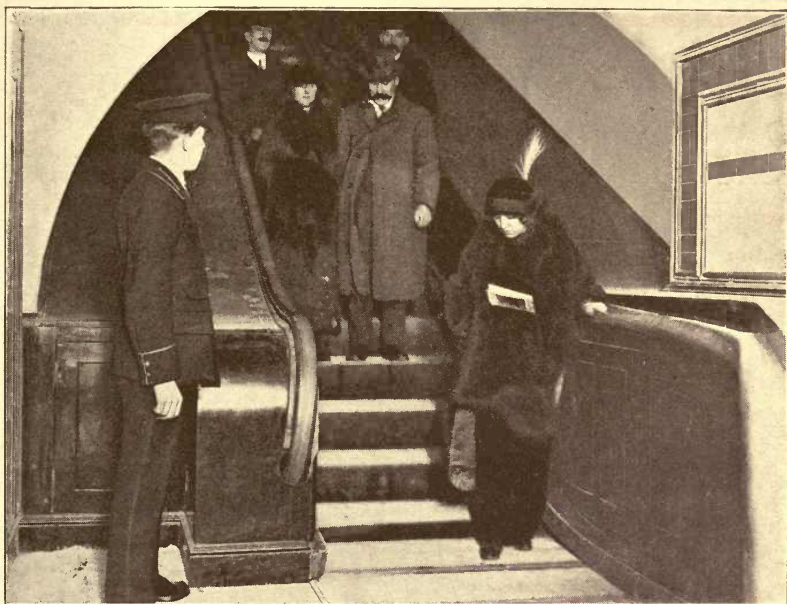
metal arms upheld by powerful springs ; trains which take current from ground lines do so by means of " shoes "—heavy metal blocks which slide along the rails.

But electric railways have other electrical things besides trains, among them being ingenious signal and safety devices. In many places, indeed, the trains do their own signalling and protect them-

ELECTRIC TRAINS

selves by closing the gate of each section of line as they enter, reopening it as they pass on into the next section. Although the "gates" are just small iron bars which rise alongside the rail, it would be useless for a train to disregard the signal and try to pass, for the "gate" would cut off the power and quickly bring the train to a standstill.

Another clever device used on electric trains is rather gruesomely known as "The dead man's handle." This consists of a small disc on a stalk—it looks rather like a mushroom. When the driver rests his hand on the control lever the stalk sinks into a recess and switches on the current; but should the driver be suddenly taken ill, or for some reason remove his hand from the control lever, the spring under the disc pushes it up again, the current is disconnected, and the train comes to a standstill.



A MOVING STAIRWAY.

[Alfred.]

WONDERS OF THE UNDERGROUND

THE tube railways of London are generally known as "The Underground," but they are so marvellous that they should really be called "The Wonderground." Wonders begin directly you step into these magic caves. You put a penny in a slot and a ticket pops out, or if you use one of the new passimeter offices you tell the Magician (the railway doesn't really know he's a magician and calls him just a ticket clerk)—you tell him

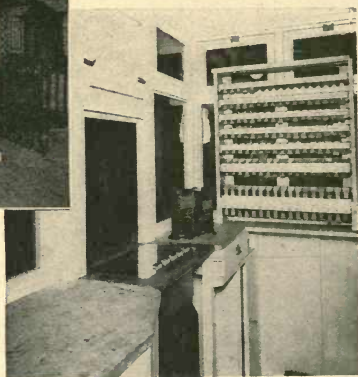
WONDERS OF THE UNDERGROUND

where you want to go, and almost before you have had time to add "please" a ticket pops up from a slit in the table



THE GATE OF THE UNDERGROUND.

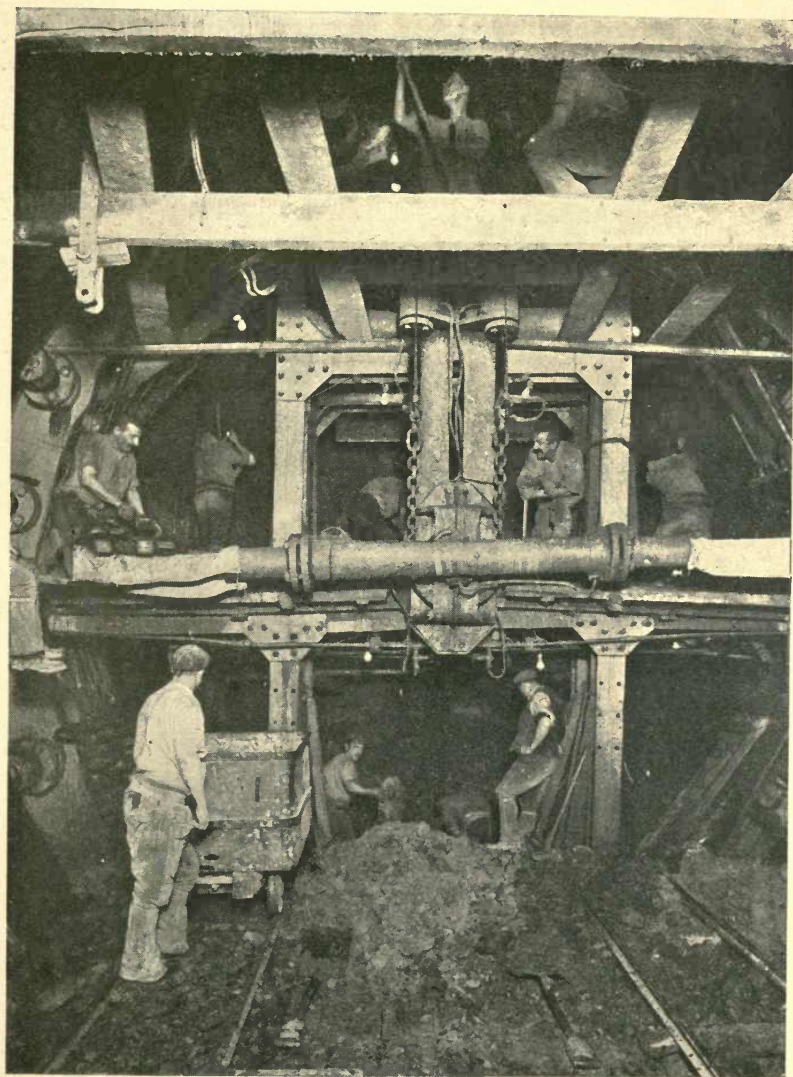
THE TICKET CLERK PRESSES ONE OF THE KNOBS SHOWN IN THE SECOND PHOTOGRAPH, A TICKET POPS UP AND THE GATE IS OPENED.



[Topical.

and the bar in front of you moves aside to admit you to the Wonderground.

You can descend to the magic caves by lift, or by stairs that actually do go up and down ("like wooden waterfalls," one little girl said; and she was right). If you use the lift, you find, on reaching the bottom, that the gate opens without anybody touching it, and, stepping through, you find yourself in a busy city, with

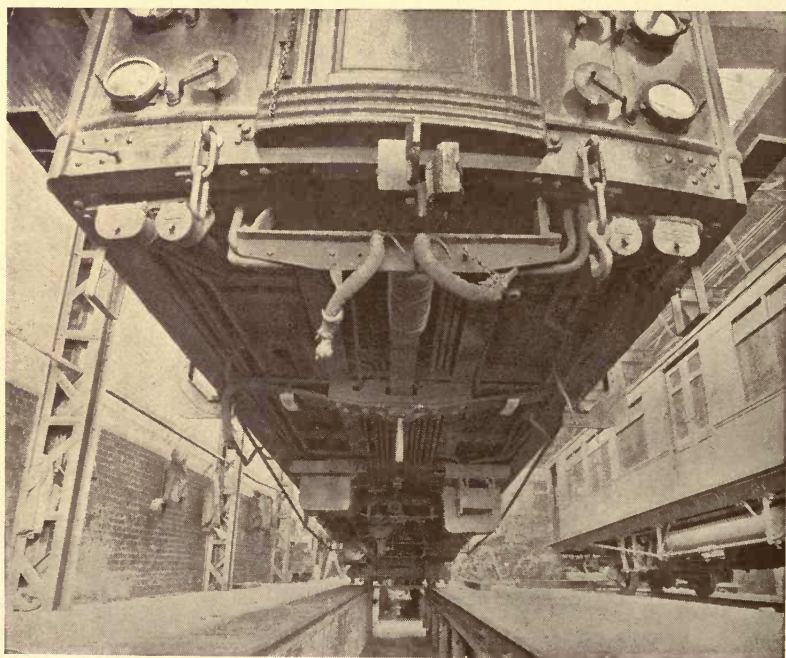


BUILDING A TUBE TUNNEL.

WONDERS OF THE UNDERGROUND

streets right and left, up and down, back and forward. Signposts point the way at cross-roads, and here and there are lighted signs that read your thoughts and tell you just what you want to know about your train. All the passages are covered with white tiles and there are so many lights that it is almost as bright as day.

Over the platform are more thought-reading signs. You wonder when your



UNDER THE UNDERGROUND: BENEATH A DISTRICT RAILWAY ELECTRIC CAR.

WONDERS OF THE UNDERGROUND



A HEADWAY CLOCK.
THE CLOCK TELLS EXACTLY HOW MANY
MINUTES HAVE PASSED SINCE THE TRAIN
IN FRONT WENT THROUGH.

you must wait for the next train. You wonder how long it is since a train passed through, and at the end of the platform is a clock which tells you just how many minutes ago the last train left.

Then you see signs telling you to change here

train is coming, and the sign immediately tells you it will be "Number Two," that is, the train after the next. You wonder whether it stops at your station, and the sign says, "Not stopping at South Kensington," so that if you want to get out for the Museums



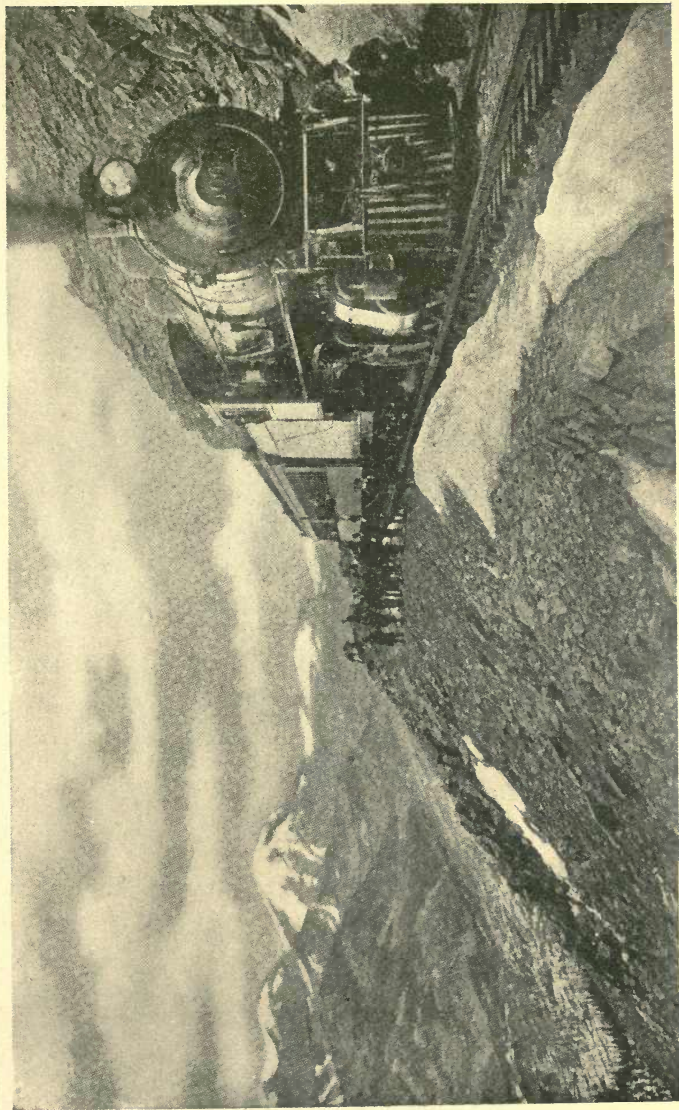
A TUBE STATION.

WONDERS OF THE UNDERGROUND

for the Piccadilly Railway, or the Bakerloo, and following the directions you find yourself in the tubes of quite another railway; so that you can make journeys from any corner of London to any other corner without once leaving the Underground, though you may travel by half a dozen different tubes.

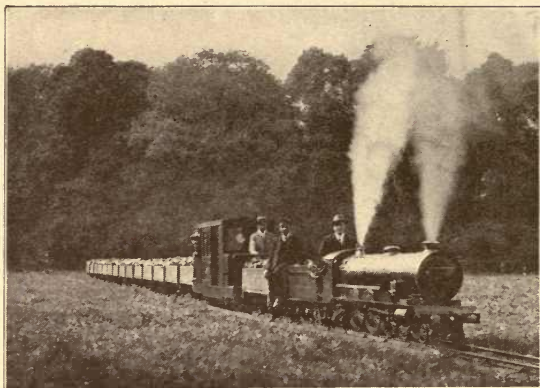
Although it is by no means easy to build a tube railway hundreds of feet below the ground, it is less easy to make one quite close to the surface. The reason is that the "lower" tubes are far below the water pipes, drain pipes, gas pipes, electricity mains, telephone and telegraph wires, and so are able to drive straight ahead, while the "upper" tubes have to overcome all these obstacles in addition to the foundations of great buildings.

But the wonders of the Underground are endless, and even include a museum of birds—some of them rare—which have been found on the lines and are preserved in a glass case at one of the city stations.



THE HIGHEST STANDARD GAUGE RAILWAY.

A UNION PACIFIC TRAIN AT THE CONTINENTAL DIVIDE, COLORADO, U.S.A.



ON THE ESKDALE RAILWAY.

MODEL RAILWAYS

EVERY sensible little boy means to become an engine-driver, of course. But not every one knows where to find model railways with real engines that haul real trucks filled with real passengers.

The picture on the opposite page shows a train on the miniature railway from Barmouth Ferry, in North Wales, to Fairbourne. The gauge is only fifteen inches, but the engine weighs $1\frac{3}{4}$ tons and can pull very respectable loads, as you can see by the photograph.

There is a much more important line of the same kind in the Lake District. This is known as the Eskdale Railway.

MODEL RAILWAYS

It is over seven miles long, and the locomotives are just a quarter of the size of an ordinary main-line engine.

Though these railways look like big and very lovely toys, they really do quite hard work, hauling trains of boys and girls, mothers and fathers, aunts and uncles. They run according to time table, and trains on the Eskdale Railway even have a slip coach attached, which is unhooked while the train is running, and is gradually halted at a station where the train itself does not stop.



A SEASIDE SPECIAL.

[Kodak Snapshot.]

A TRAIN ON THE MINIATURE RAILWAY BETWEEN BARMOUTH FERRY AND FAIRBOURNE,
NORTH WALES.



[New Zealand Government Railways.]

A LONG PULL AND A STRONG PULL
AND A PUSH AS WELL ARE NEEDED TO GET THIS TRAIN OVER A STEEP INCLINE IN NEW ZEALAND

MOUNTAIN RAILWAYS

IN comparatively flat countries like England mountains do not often form a barrier to railways. But in really mountainous countries it is, as one man said, “impossible to dodge the bumps” by running through valleys, and so the “bumps”—which are more often humps hundreds of miles long—have to be either tunnelled or climbed.

At first sight, it seems impossible that a train should be able to climb a mountain and drag a heavy load behind it, but in Switzerland, Norway, and other

MOUNTAIN RAILWAYS

countries, important expresses climb over mountains as part of their daily run. Of course, the lines do not strike straight up the mountain-side, but curl and twist in order to make the journey as easy as possible. Some railways actually make almost complete circles as they wind up, and at least one railway reaches higher levels by means of tunnels which make several corkscrew turns inside the mountain !

Of course, trains with ordinary wheels and ordinary rails would never be able to climb such steep gradients : the wheels would slip in the most dangerous manner. Mountain railway engines, therefore, are generally fitted with cog-wheels which fit into cogged rails laid between the track, and it is by means of these cogs that the engines work their way up. Another system, shown in the picture facing, has, instead of the ordinary cog rail, a centre rail which the engine grips between two wheels mounted at right angles to the running wheels.

It would be a very serious matter if

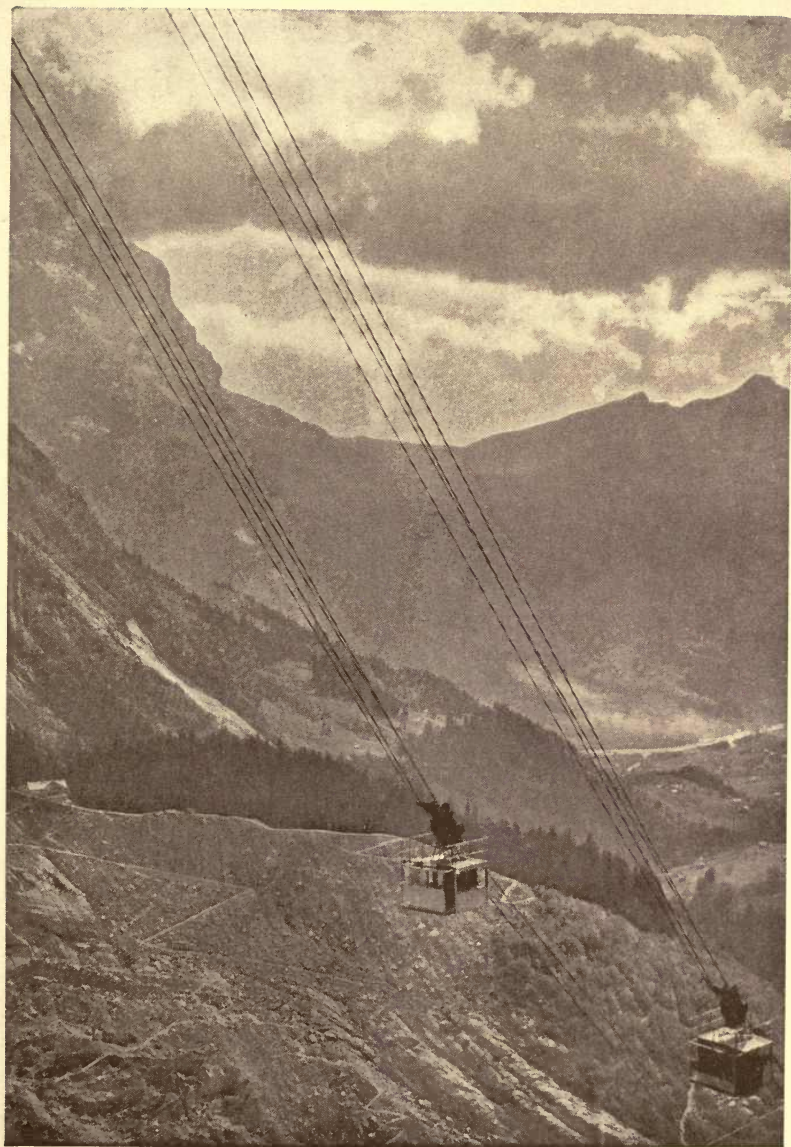
MOUNTAIN RAILWAYS

the couplings of a mountain train were to break, so the engine is nearly always placed at the lower end of the train, both going up and descending. This is done on the only mountain railway in Britain—that up Snowdon.

In many places the mountain-side is so steep that to lay a proper track would be a very difficult undertaking indeed. Such a mountain is the Wetterhorn, in Switzerland. Railway engineers are seldom daunted, however, and instead of the costly and difficult rail track they devised a “line”—and if you look at



THE HIGHEST RAILWAY IN AMERICA.
PIKE'S PEAK RACK RAILWAY, COLORADO, WHICH CLIMBS THROUGH CLOUDS TO A HEIGHT OF
14,107 FEET.



ANOTHER KIND OF RAILWAY LINE !

THE CARS CLIMB UP THE MIGHTY WETTERHORN BY MEANS OF STEEL CABLES.

MOUNTAIN RAILWAYS

the picture you will see that it is really a line !—consisting of stout steel ropes, up and down which cars pass as smoothly as on an iron rail laid on a properly prepared bed. The two cars on this railway are tied together by a very long steel rope which passes over a wheel at the top ; as one car descends, it helps to pull the other up.



[By courtesy of the Mount Tamalpais Railway.]

THE CROOKEDEST RAILWAY IN THE WORLD.

MOUNT TAMALPAIS SCENIC RAILWAY, CALIFORNIA.



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